ON SOME LAND SHELLS COLLECTED BY DR. HIRAM BINGHAM IN PERU.

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During a recent mission to Peru Dr. Hiram Bingham, of Yale University, made a small collection of land shells in a little visited part of Peru, which through his kindness and that of Dr. Leon J. Cole of that university were in part sent to me for examination. Other portions of the collection were presented by Doctor Bingham to Mr. Barbour of the Museum of Comparative Zoology, who kindly lent them for study, and Doctor Cooke of the Bishop Memorial Museum at Honolulu.

Doctor Bingham thus describes the locality where the shells were found, of which the accompanying illustration, from a photograph taken by him, will aid in characterizing their habitat.

We left Chincheros on February 17 about 10 o'clock in the morning, reaching the battlefield of Bombon at 11.15 and having our first view of the Rio Pampas at 12.45 p. m. Its height above the sea at this point is about 6,000 feet.

On its banks are mimosa trees and several varieties of cactus. The shells occurred in great profusion both on the cactus and the mimosas which struck me as very odd, as I had collected many land shells on the Hawaiian Islands and do not remember to have ever seen shells in such profusion anywhere. Furthermore in the Hawaiian Islands they very rarely live on either cactus or mimosa, preferring the indigenous plants and trees.

After reaching the level of the river our path followed it in a northerly direction downstream for some distance amongst groves of mimosa trees and different kinds of cacti. This is a famous place for mosquitoes, and there is said to be a great deal of malaria in the vicinity.

The bridge over the Rio Pampas has long attracted the notice of travelers. There are two pictures of it in E. G. Squier's book on Peru, and although wire rope has replaced the old cables it is still a most unwelcome feature of the road from the point of view of the mules. The bridge to-day is at the foot of perpendicular cliffs. The surrounding scenery is not so imposing as that of the valley of the Apurimac, but is nevertheless magnificent. The bridge is about 150 feet long and about 50 feet above the river. After leaving the bridge we ascended a precipitous cliff by a narrow winding path and found ourselves on a terrace where enterprising Peruvians had planted fields of sugar cane.

The trees and shrubs on which I found the shells were not more than 50 or 75 feet above the river. I should judge from the presence of the mimosa and cactus that the region was not a very rainy one. The shells were placed so thickly on the trunks of

the trees as to make them faintly white in places as large as the palm of one's hand. I estimated that on some of the cacti there were fully 500 shells of all sizes. They seemed to prefer the vicinity of the ground and I saw very few shells on the upper branches or on the leaves. I did not see any shells until the path approached the bank of the stream at an altitude of about 50 feet above the level of the water. Our path ran beside the bank of the stream for at least 2 miles and possibly 3, the shells occurring in great profusion during the entire distance. After we crossed the river on the bridge we saw no more shells, for we climbed at once to the terrace a couple of hundred feet above the river and thus proceeded to Pajonal.

The shells occur on the trees in the immediate foreground of the picture.

The shells comprised various species and varieties of *Bulimulus* and a single species of *Clausilia*. The latter was submitted to Dr. H. A. Pilsbry, who has kindly furnished a description of it.

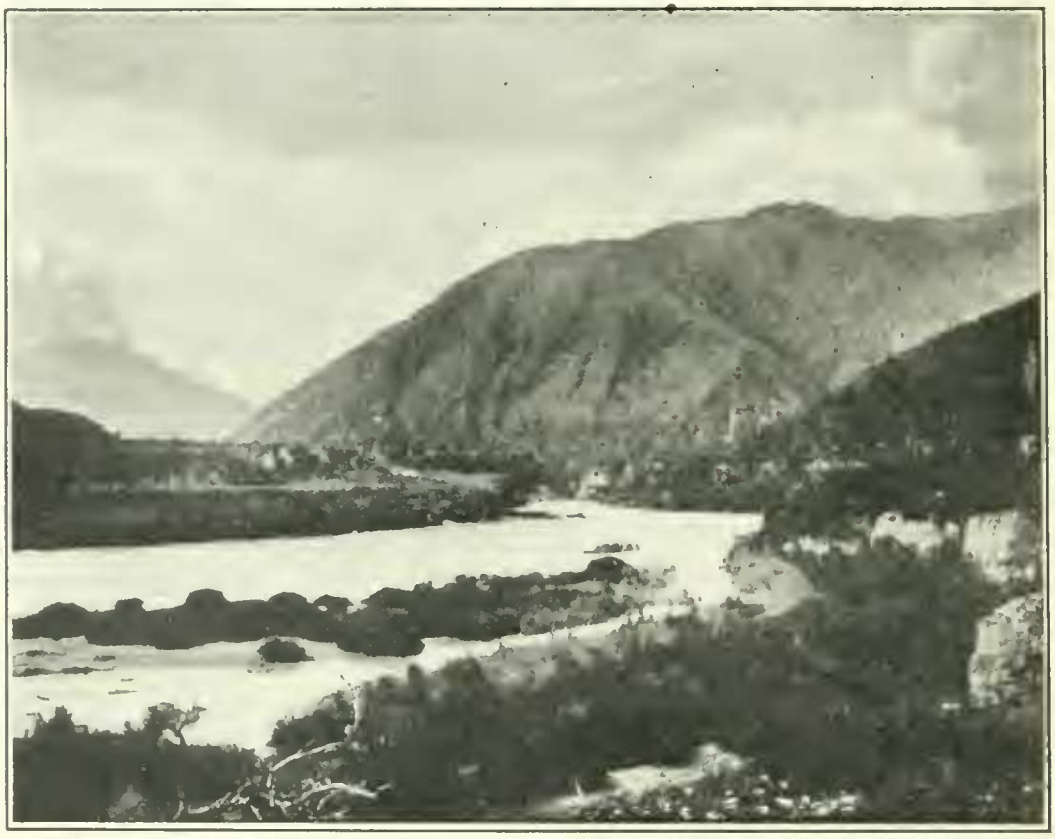

FIG. 1.—VIEW OF THE RIO PAMPAS LOOKING DOWNSTREAM.

LIST OF THE SPECIES COLLECTED.

BULIMULUS (BOSTRYX) INFUNDIBULUM Pfeiffer.

Bulimulus infundibulum PFEIFFER, Proc. Zool. Soc. London, 1851, p. 255.—MORELET, Sér. Conch., vol. 3, 1863, p. 204, pl. 11, fig. 6.

The specimens obtained were some 20 millimeters long, the vertical length of the aperture being 7 millimeters. The color variations were ashy white with a brownish nucleus, the same streaked with tawny brown, and lastly with two (not one as stated by Morelet in contradiction to his figure) brown spiral bands. The apex is more produced and mammillary than in Morelet's figure. He states that it was found on grasses in stony places, and gives the habitat as the high-

lands between the valley of Abancay and that of Ayacucho. The species has an arboreal aspect and the statement that it was found on grasses, in view of Doctor Bingham's experience, seems to need confirmation.

U. S. Nat. Mus. No. 209266.

BULIMULUS (BOSTRYX) UMBILICATELLUS Pilsbry.

Bulimulus (Bostryx) infundibulum, var. *umbilicatellus* PILSBRY, Manual, vol. 10, 1895, p. 131, pl. 44, figs. 93, 94.

The specimens obtained were ashy white, with livid brown coloration near the tip of the spire and in the umbilicus, and somewhat fainter in the aperture. The profile is more convex toward the middle; that is, the shell is more spindle-shaped and less evenly conic than the specimen figured in the Manual, and the umbilicus more tubular and less funicular. The nucleus has about 3½ translucent smooth whorls and the remainder of the shell 7½ whorls. The axial striation does not differ, in the specimens examined, from that carried by *B. infundibulum*. The length of the shell is 21, the maximum diameter 6, the vertical height of the aperture 6.5 mm. In the absence of connecting gradations this seems to be a good species.

U. S. Nat. Mus. No. 209267.

BULIMULUS (BOSTRYX) ALBICOLOR Morelet.

Bulimulus albicolor MORELET, Journ. de Conchyl., vol. 8, p. 374, 1860; Sér. Conch., vol. 3, 1863, p. 199, pl. 11, fig. 9.

The average of specimens of this form obtained were intermediate in size between the figures given for his extremes by Morelet, otherwise agreeing precisely with his figures and descriptions. The series examined, however, shows variations in the umbilical region from closed and merely rimate, to nearly as wide as in the next species, of which I am inclined to consider it a mere mutation. According to Angrand this form inhabits Huanta and the valley of the Apurimac River, Peru.

U. S. Nat. Mus. No. 209268.

BULIMULUS (BOSTRYX) OROPHILUS Morelet, var. CEREICOLA Morelet.

Bulimus cereicola MORELET, Sér. Conch., vol. 3, 1863, p. 192, pl. 9, fig. 7.
Bulimus lesueurianus MORELET, Sér. Conch., vol. 3, 1863, p. 200, pl. 9, fig. 4.
Bulimus orophilus MORELET, Sér. Conch., vol. 3, 1863, p. 189, pl. 9, fig. 6, 6 *bis*.
Bulimus albicolor MORELET, Sér. Conch., vol. 3, 1863, p. 199, pl. 9, fig. 9.

This species was the most abundant of those collected, comprising the axially streaked (*cereicola*), the spirally banded (*lesueurianus*), and the plain whitish (*albicolor*); with the umbilicus varying from wide to entirely closed. The typical color form with the base dark colored and the portion above the periphery axially streaked, does not happen to occur in Doctor Bingham's collection. The color of the nucleus varies from pale to dark horn color or pink and even dark

livid brown. The umbilicus varies as above stated, the color variations are from pale unicolorate to profusely brown axially streaked or with two dark spiral bands, of which one is above the periphery and the other below it, the latter being covered by the advancing whorl. The form is quite constant, being rather elongate and attenuate toward both ends. The *B. stenacme* Pfeiffer, *B. reconditus* and *nigropileatus* Reeve, are all of a more conical type, with a broader not attenuate last whorl, and while doubtless to be united with each other under the earliest name, are, so far as my material permits me to judge, better kept separate from the present group as Morelet proposed.

The species is reported on Angrand's authority as living on cacti of the genus *Cereus*, in the interior of the sierra west of Cuzco, in the valleys of Abancay and Acostambo, and is doubtless widely distributed.

U. S. Nat. Mus. No. 209269.

BULIMULUS (LISSOACME) BINGHAMI, new species.

Shell stout, wide, conic, with a smooth nucleus of about two whorls and four subsequent whorls; for somewhat over two whorls the young shell has a prominent keel against which the suture is closely appressed, so that the presence of the keel requires close examination to recognize; a little beyond the end of the second whorl the keel disappears below the suture, and only very obscure traces of it remain on the last whorl; the spire as a whole is convexly conic, the separate whorls project but little; the last whorl rapidly enlarges with a rounded periphery, evenly rounded into a wide subcylindric umbilicus; sculpture of well marked retractively arcuate wrinkles, with subequal interspaces obsoletely spirally striate; the sculpture is most obvious on the spire and on the part of the last whorl behind the periphery; toward the aperture the whorl descends a little below the periphery; the well-reflected outer lip bends markedly toward the posterior end of the pillar lip, and the two are joined by a thin glaze over the body; the pillar lip is very broad and thin, half obscuring the umbilicus; the pillar is straight without any twist or fold; the color of the shell is yellowish white, with more or less distinct pale brownish spiral lines or narrow bands; the lip is whitish, the interior of the aperture pale yellowish-brown; the nucleus is slightly mammillary. Height of shell, 36; of last whorl, 19; of aperture (vertical), 13; maximum diameter of shell, 20; of aperture, 11; of umbilicus, 2.5 mm.

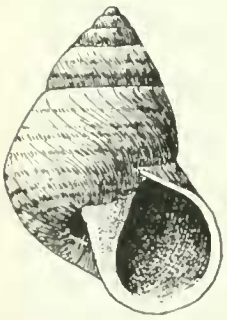

FIG. 2.—BULIMULUS (LISSOACME) BINGHAMI.

Collected from cacti on the banks of the Rio Pampas, Peru, by Dr. Hiram Bingham.

This species might be assigned either to the group of *B. reentzi* Philippi or *B. derelictus* Broderip, but differs in specific characters from either of the known species assigned to these groups. I have much pleasure in naming it after the collector.

Type.—U. S. Nat. Mus. No. 209270.

BULIMULUS (LISSOACME) PTYALUM, new species.

Shell plump, conic, with a mammillary smooth brown nucleus and a generally bluish white color with sparse irregularly distributed black dots; nucleus with two and a half translucent whorls and an apical dimple; subsequent whorls feebly rounded, with an appressed suture which is in the earlier whorls laid against a peripheral angle of which there is no trace in the later ones; sculpture of fine feeble retractive flexuous wrinkles, usually with narrower interspaces, becoming obsolete on the last whorl, and crossed by fine feeble spiral striation, most evident in the interspaces on the earlier whorls; last whorl somewhat produced, moderately rounded, and curving roundly into a deep subcylindric umbilicus; aperture semilunate, the basal and outer margins paler, reflected; interior and pillar dark brownish; the lips approach each other on the body, the outer one hardly descending, the inner one wide, hardly reflected over the umbilicus; pillar without twist or fold. Height of shell 25; of last worl 18; of aperture 8.5; of umbilicus 1.7 mm.

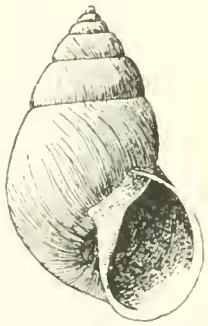

FIG. 3.—BULIMULUS (LISSOACME) PTYALUM.

On cacti and mimosa on the banks of the Rio Pampas, Peru, collected by Doctor Bingham.

This species evidently belongs to the same group as the last, though specifically distinct. It has some resemblance to the *B. rhodolarynx* of Reeve (placed by Pilsbry provisionally in the genus *Neopetraeus*) but is a much smaller shell, with more ovoid and less protracted aperture.

Type.—U. S. Nat. Mus. No. 209271.

CLAUSILIA (NENIA) PAMPASENSIS Pilsbry, new species.

The shell is slender, fusiform, somewhat attenuated at the apex, lustreless, gray-white over a dull brown surface, visible where the outer sculptured layer is rubbed off. Sculpture of very fine and close, unequal and uneven striæ in the direction of growth lines. In places they are discontinuous, forming long, lanceolate granules. This white striate layer is worn off on the ventral side of each whorl. Whorls $12\frac{1}{2}$, the first two brown and glossy. To the fourth or fifth whorl the diameter scarcely increases; then the whorls increase slowly in diameter to the penultimate which is widest, and, like those preceding, is moderately convex. The last whorl is flattened, tapers toward the base, and finally becomes free, descending more rapidly to the

aperture, which stands forward about 1 mm. The neck is deeply grooved above the suture. The aperture is slightly oblique, rounded-ovate, with continuous, reflected, pale brownish peristome. The superior lamella is acute, concave on the left side, continuous with the spiral lamella, which is low and short, running inward to a dorsal position. The inferior lamella is immersed, barely visible in a front view. It ascends in a long sigmoid curve, and is somewhat thickened within. The subcolumellar lamella is wholly immersed. The principal plica is high, dorsal, and less than a half whorl long. The lamella is low and lunate.

FIG. 4. CLAUSILIA (NENIA) PAMPASENSIS.

Length 20.1, diameter 3.9 mm.; longest axis aperture 3.8, width 3 mm. The clausilium is evenly curved, slightly twisted spirally, the distal half tapering to the obtuse, thickened apex.

Type.—U. S. Nat. Mus. No. 209272.

By its sculpture this species resembles *C. pilsbryi* Sykes and *C. chacaensis* Lubomirski, but in those the striæ are more distinctly interrupted and finer. It differs from both by its short aperture, proportioned more as in *C. epitonium;* both of the other species named having the aperture conspicuously lengthened. The distinct attenuation of the earlier whorls is a further distinctive feature of the new form.

The latest list of South American Clausiliæ[a] enumerates 37 species. A few species described since that time, together with some omitted, brings the number up to about 45 species, exclusive of those Clausiliidæ belonging to the genus *Temesa*. (H. A. P.)

[a] E. R. Sykes, Journ. Malac., vol. 5, 1896, p. 57.